

REMARKS / ARGUMENTS

The Examiner has rejected each of claims 1-9, 11-16 and 20 as obvious over US patent 1,482,812 to Roberts in view of PCT/AU02/00824 to Barbieri. The Examiner has further objected to Claim 10 when the disclosures of Roberts and Barbieri are combined with those of US 4,337,584 to Johnson and has rejected claims 17-19 and 21 as obvious when the disclosures of Roberts and Barbieri are combined with those of Wilson

US Patent No. 1,482,812

This United States patent granted to Roberts in 1924 "relates to the drying of more or less finely divided material such as diatomaceous earth or other materials which require dehydration or drying in order to render them available for use" (page 1, lines 9-13). The patent describes a vertical drying apparatus in which material to be dried enters from above and is "retained by and descends between these opposing baffles or louvre plates, forming a vertical curtain extending the full height of the chamber" (page 2, lines 8-11). Means are provided for passing a drying medium such as hot gases into chambers adjacent the vertical curtain, with the intention that the drying gas is able to penetrate into the vertical curtain of material to be dried through "the openings or slots between adjacent baffles" (page 3, lines 33 and 34).

The Roberts patent includes no disclosure or suggestion that walls of the drying unit could be formed from a substantially continuous corrugated plate, wherein each corrugation comprises a supported leg and a permeable leg and wherein the ingress and egress openings are provided within the permeable leg. Further, Roberts does not include any disclosure or suggestion that the drying unit could be used for, or is adapted for, drying of pellets containing brown coal. Although Roberts refers to "channeling" being prevented (see page 1, line 65), it is highly doubtful that channeling would be prevented in the Roberts arrangement in view of the large openings or slots between adjacent baffles through which air is intended to pass.

The Roberts patent also notes that "the inclined supports are arranged so that the enclosed material will move or gravitate in a zigzag manner. This is done for two reasons: first to prevent arching of material between supports...." (page 3, lines 115-119). While Roberts tries to discourage arching, Applicants find that it is in fact desirable in the present invention for some arching of the pellets containing brown coal to take place at least within upper regions of the drying apparatus.

PCT/A UO2/00824 to Barbieri

Barbieri discloses a fluid/solid interaction apparatus that is disclosed to have a variety of uses, including drying of solid fuels, dust removal from gases, heat exchange, humidifying and dehumidifying. It is apparent therefore, that the apparatus is not specifically designed or adapted for drying of brown coal containing pellets. Indeed the Barbieri patent discloses that the "solid material" that can be loaded into the apparatus include granular solids such as wheat or coal or pelletized minerals. Interestingly, the document notes that the fluid that can be passed through these solid materials can be a liquid, such that in fact the apparatus could be used for wetting of materials rather than for drying. While the document does include reference to drying of pelletized brown coal it equally refers to drying of granulated coal or other material. The device is clearly, therefore, not particularly adapted for drying of pellets containing brown coal.

The apparatus disclosed in the Barbieri patent includes a plurality of passages extending between a pair of end walls where there is an upper part for receiving solid material and a lower part to which the solid material will flow and wherein the sides of the passages are defined by side walls of a plurality of inlet fluid ducts and outlet fluid ducts that are internal to the apparatus. As depicted clearly in Figure 2 the side walls of the inlet fluid ducts and outlet fluid ducts comprise vertically oriented perforated walls. There is no disclosure or suggestion within the document that side walls of the fluid ducts could constitute a substantially continuous corrugated plate wherein each corrugation comprises a supporting leg and a permeable leg angled with respect to

each other and wherein ingress and egress openings are provided within the permeable leg. Indeed the Barbieri patent discloses at page 8, third paragraph that the "apparatus of the invention is preferably designed to have as few horizontal flat surfaces as possible in order to reduce internal dust build up and to avoid impeding the passage of the solid material". This would appear to constitute a teaching away from the adoption of permeable walls comprising a substantially continuous corrugated plate as defined in the present invention.

It is apparent that the substantially vertical permeable wall arrangement disclosed in the Barbieri patent is highly problematic and should be prone to blockages from the solid material contained within the apparatus, and should thus be unlikely to allow appropriate airflow characteristics for drying of pellets containing brown coal.

The present invention

The claims of the present application are now limited to a dryer for drying pellets containing brown coal, and require that the gas permeable walls comprise a substantially continuous corrugated plate, wherein each corrugation comprises a supporting leg and a permeable leg angled with respect to each other and wherein ingress and egress openings are within the permeable leg of the gas permeable walls.

As the Examiner will understand it is no simple matter to devise a means of effectively drying brown coal containing pellets and to do so in an efficient and scalable manner. A critical factor in the success of the present invention is in devising an apparatus that results in optimal drying air flow characteristics, and crucial to this is having plenty of free space within the drying apparatus, allowing the drying air to be moved efficiently through the material and maximizing the surface contact between the drying air and the brown coal containing pellets. Adopting an apparatus that is suitable for the use of brown coal in the form of pellets is particularly important in this regard. In contrast, granular or particulate brown coal does not allow sufficient drying airflow and free space within the drying apparatus.

Key features of the present invention that give rise to its adaptation for the drying of brown coal containing pellets include the substantially continuous corrugated plate gas permeable walls, wherein each corrugation comprises a supporting leg and a permeable leg that are angled with respect to each other, and wherein ingress and egress openings are provided within the permeable leg. The present inventor has determined that this arrangement allows optimal airflow characteristics through the drying apparatus and overcomes problems associated with prior art apparatus associated with blockage of airflow ducts, channeling and blowout. For example, through analysis of the apparatus described in the Roberts patent it is understood that the drying arrangement depicted therein would have been prone to both blowout and channeling problems. This conclusion is reached because of the large airflow spaces (the slats between the baffles or louvre plates) through which the drying gas penetrates into the solid material and because the document specifies that it is intended for drying of granulated material. It is submitted that at relatively low drying gas pressure the drying gas would not satisfactorily penetrate through the material to be dried due to the lack of free space within the material, resulting in the need for higher drying gas pressures, which are both inefficient and would be likely to result in blowback of the material being dried through the slats between the baffles or louvers or channeling of the drying gas through the solid material. The characteristic of channeling is well understood in the art to result from the airflow pattern of seeking the path of least resistance. If channeling occurs, large volumes of the drying gas would pass through the channeled region with the result that the gas would not penetrate through the material to be dried, such that drying is ineffective.

In the case of the Barbieri patent wherein there is a substantially vertical fluid permeable wall it is highly likely with an arrangement such as this that the openings within the wall would be subject to blockage by the solid material passing through the apparatus, with the result that the efficiency of drying (or whatever other operation is being conducted) would be diminished.

The present invention operates by virtue of allowing sufficient free space within the drying apparatus to allow optimal airflow characteristics, resulting in surface evaporation on the moist brown coal containing pellets contained within the apparatus. As moisture is evaporated from the surface of the pellets the pellets contract in size forcing more moisture to the surface and more complete drying throughout the pellets as they progress downwards within the drying apparatus. The result of this is that the pellets in upper regions of the drying apparatus are larger in size than those lower down. This fact, in conjunction with the corrugated plate arrangement of the gas permeable walls and wherein the ingress and egress openings are provided in the permeable leg gives rise to some arching or bridging of the pellets within the upper regions of the apparatus. That is, those larger pellets in the higher regions of the apparatus are supported by one another in a bridging fashion across the span of the apparatus. As the pellets dry and contract they are released from this arched or bridging phenomenon and allowed to progress through to lower regions of the apparatus, but this only takes place when they have assumed the necessary hardness as a result of drying to allow their passage without substantial fracture. Thus, the arrangement of the apparatus as claimed gives rise to an ideal combination of airflow characteristics and structural support for the drying coal containing pellets to allow their optimal drying and passage through the drying apparatus. None of these features has been alluded to or suggested within any of the cited prior art document and could not have been understood or expected by a person skilled in the art prior to the conception of the present invention.

Non-Obviousness

It is submitted that if a skilled person wished to solve problems associated with drying of brown coal containing pellets it would not have been obvious to the skilled person to combine the disclosures within the Barbieri and Roberts references. Indeed, the Roberts reference has nothing to do with the problem of drying brown coal containing pellets. Even if the Roberts reference was identified as being relevant to the problem by

a skilled person, which is doubtful in view of the clear teaching within that document that it relates to the drying of finely divided materials, the skilled person would have dismissed its relevance in view of the clear teaching away from the present invention at page 3, lines 115-119, where it states as follows:

"The inclined supports are arranged so that the enclosed material will move or gravitate in a zigzag manner. This is done for two reasons: first to prevent arching of material between supports....."

As explained above, some arching of the brown coal containing pellets in upper regions of the dryer according to the present invention is a key and intended aspect of the invention, and results from the claimed structure.

It is further submitted that because of the arrangement described in the Roberts reference the apparatus concerned would be subject to the problems of blowback and channeling. Accordingly, a person skilled in the art would not consider the apparatus described therein to constitute a part of a solution to the problem of drying brown coal containing pellets.

Furthermore, even if a skilled person was to combine the teaching within the Roberts and Barbieri documents, which it is submitted they would not, the combination would not result in the invention as presently claimed. It would be no simple matter, contrary to the suggestion of the Examiner, to replace the louvred walls of the Roberts apparatus with a perforated vertical wall as disclosed in Barbieri, given that the two apparatus are structurally so distinct and because the means of mounting the louvred plates or baffles in Roberts is so different from both the vertical permeable walls of Barbieri and indeed, the arrangement claimed in the present invention. Even if these teachings were combined most likely outcome would be an arrangement where there are openings either on all faces of the side walls (that is both substantially vertical and substantially horizontal faces of each corrugation) or, more likely, just on vertical faces of each corrugation (given that the openings appear only on a vertical wall in the case of

Application No. 10/573,057
Amdt. dated 28 May 2010
Reply to Office Action of 30 December 2009

Barbieri). There is nothing in any of the prior art to suggest adopting an arrangement as claimed in the present invention wherein the gas permeable walls comprise a substantially continuous corrugated plate and wherein each corrugation comprises a supporting leg and a permeable leg angled with respect to each other, where the ingress and egress openings are provided within the permeable leg.

Nothing within the cited documents would in any way suggest to a skilled person that by adopting the approach claimed within the present application, in conjunction with utilizing a pelletized brown coal containing feedstock, it would be possible to ensure the appropriate airflow conditions to eliminate channeling and blowback and allow for the arching or bridging phenomenon in upper regions of the dryer (directly taught away from in Roberts) that enables the optimal drying and passage of the coal containing pellets through the dryer, without their undue fragmentation.

With regard to Claim 10, Johnson does not cure the deficiencies noted above with regard to Roberts and Barbieri and Claim 1, and thus being ultimately dependent on Claim 1, should be patentable as well.

With regard to claims 17-19 and 21, Wilson does not cure the deficiencies noted above in Roberts and Barbieri, i.e., the use of gas permeable walls that comprise a "substantially continuous corrugated plate wherein each corrugation comprises a supporting leg and a permeable leg angled with respect to each other."

Applicant hereby requests reconsideration and reexamination thereof. No further fee or petition is believed to be necessary. However, should any further fee be needed, please charge our Deposit Account No. 23-0920, and deem this paper to be the required petition.

With the above amendments and remarks, this application is considered ready for allowance and applicant earnestly solicits an early notice of same. Should the Examiner be of the opinion that a telephone conference would expedite prosecution of

Application No. 10/573,057
Amdt. dated 28 May 2010
Reply to Office Action of 30 December 2009

the subject application, he/she is respectfully requested to call the undersigned at the below listed number.

Application No. 10/573,057
Amdt. dated 28 May 2010
Reply to Office Action of 30 December 2009

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Gerald T. Shekleton". The signature is fluid and cursive, with the first name "Gerald" being more prominent than the last name "Shekleton".

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